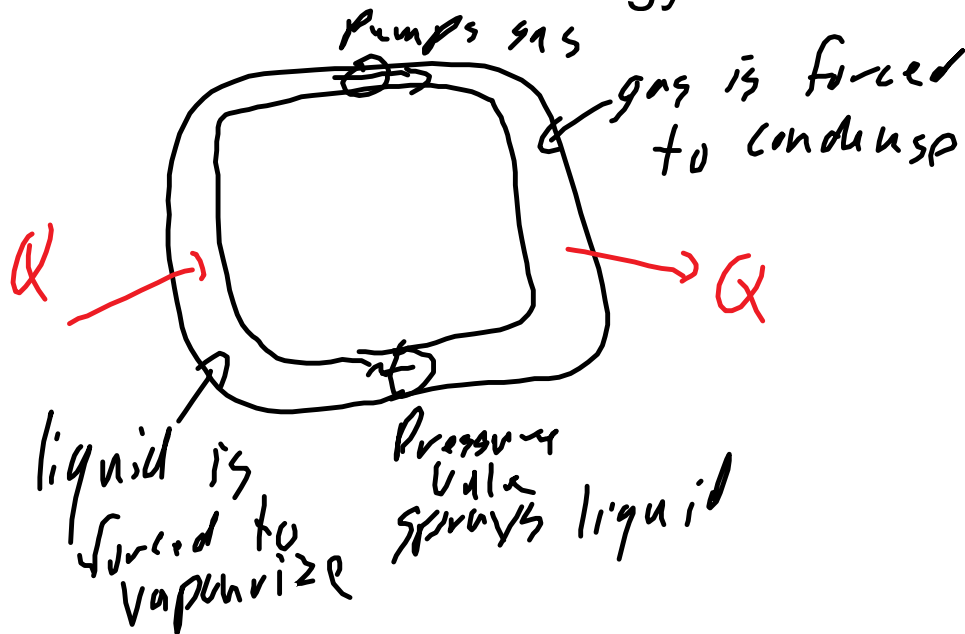


Review - how does a refrigerator work?

Chris - does work to transfer heat from cold to hot.

evaporation - takes energy from surroundings

condensation - releases energy to surroundings



Waves

define

Wave - transfer of energy through vibration

medium - substance through which the wave travels,

particle/electromagnetic waves - can go through a

vacuum - mechanical waves are vibrations in the

medium

amplitude-  $A$  or  $x_0$  - displacement from equilibrium to the maximum displacement. - electromagnetic waves - related to number of photons

frequency,  $f$  or  $\nu$ , - number of repeated events/unit time - units: Hertz,  $\text{Hz} = 1/\text{s}$

angular frequency,  $\omega = 2\pi f$  units: radians/s

period,  $T$  time between repeated events, in s.

wavelength,  $\lambda$  is the distance between the crests or troughs, in m

crest, point of maximum displacement of the medium  
trough, opposite the crest

energy - waves transfer energy proportional to the square of the amplitude for most waves.

electromagnetic waves  $E=hf$  is the energy per photon where  $h$  is Planck's constant  $6.6262 \times 10^{-34} \text{Js}$

wave speed,  $c$  or  $v$  - how fast the wave travels, determined by medium

speed of light (electromagnetic radiation) =  $c = 3.0 \times 10^8 \text{m/s}$

speed of sound =  $v$  or  $c = 340 \text{ m/s}$  depending on pressure/temperature

speed in a spring is determined by the type of spring and tension

sinusoidal, - lots of waves have sinusoidal shapes - looks like a graph of  $x = x_0 \sin \omega t$

transverse - displacement of the medium is perpendicular to the transfer of energy.

longitudinal - displacement of the medium is in the direction of the energy transfer - eg. earth quakes

have both longitudinal and transverse waves - sound  
compression - spring gets pushed together, air  
molecules

wave pulse - single disturbance

wave train - travelling waves- series of pulses

wave interference - superposition - when two waves  
meet, their displacements add

phase,  $\phi$ , how far the crests are shifted

reflection - bounce off

refraction - snell's law - changes direction going from  
one medium to another

diffraction - spreads around a barrier

dispersion - waves are deflected at different angles  
depending on the wavelength.

prepare a procedure for measuring various wave  
quantities of wave pulses on a spring.

test:

relation between wave speed and:

amplitude, frequency, wavelength,

longitude/transverse, tension, type of spring,

- principle of superposition

- reflection

$$v = \lambda f$$

$$f = 1/T$$

p428 Hecht, problems 1, 3, 7, 13, 15

